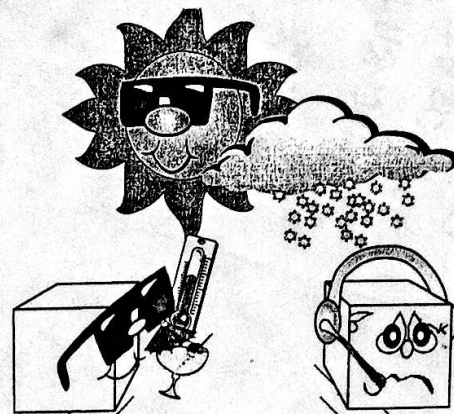


Heating/Cooling Curve

As a substance is heated, its particles begin to move faster and spread apart. The speed of the particles is related to their kinetic energy. The relative position of the particles is related to their potential energy. As solids, liquids, and gases are heated, most of the energy that is absorbed is converted to kinetic energy, and the temperature goes up. But as a substance melts or vaporizes, its particles spread out tremendously. As a result, the energy absorbed produces changes in the potential energy of the particles, so the temperature does not change as the phase changes. For that reason, the freezing point and the melting point of a substance are the same.



$$0^{\circ}\text{C} = 0^{\circ}\text{C}$$

Base your answers to the following questions on the graph below which shows 10.0 kg of a substance that is solid at 0°C and is heated at a constant rate of 60 kilojoules per minute.

1. What is the temperature at which the substance can be both in the solid and the liquid phase?

2. During which lettered intervals is the internal potential energy of the substance increasing?

3. During which lettered intervals is the kinetic energy of the particles increasing?

4. How much heat is added to the substance from the time it stops melting to the time that it begins to boil?

5. What is the total heat needed to melt the substance (starting at time 0)?

6. What is the total heat needed to vaporize the substance (starting at time 0)?

7. What is the heat of vaporization of the substance?

8. During which lettered intervals is the substance solid?

9. During which lettered intervals is the substance in the liquid phase?

10. During which lettered intervals is the substance in the vapor phase?

11. What is the temperature at which the substance can be both in the liquid and the vapor phase?

